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DESCRIPTION OF A NEW SPECIES OF
TELMATOBIINE FROG, *TELMATOBIUS*
(AMPHIBIA: LEPTODACTYLIDAE),
FROM THE ANDES OF NORTHERN CHILE

By

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Five species of anurans are known to occur in the Andes of northern Chile between latitudes of 18° and 23° S (Capurro, 1950, 1953, 1955; Noble, 1938; Schmidt, 1954); these are: *Bufo spinulosus* (Wiegmann), *Pleurodema marmorata* (Duméril and Bibron), *Telmatobius marmoratus* (Duméril and Bibron), *T. peruvianus* (Wiegmann) and *T. halli* (Noble). As a result of extensive field work in the Department of Arica in northern Chile, it is now possible to add a previously undescribed species to the anuran fauna of this area. This stream-inhabiting frog herewith is assigned to the genus *Telmatobius*. Its discovery contributes to our understanding of ecological and systematic relationships among the anurans of northern Chile, especially those that occur at high altitudes in the central cordillera of the Andes.

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3272 to W. E. Duellman) from the Graduate School of The University of Kansas, and travel to the United States was funded by the Programa Multinacional de Genética, OEA, Chile. We are indebted especially to our colleague Jaime Péfaur for his continued interest and unremitting encouragement, and herewith dedicate this new species to him with appreciation.

Telmatobius pefauri, new species

Figures 1 and 2

Holotype.—The University of Kansas Museum of Natural History (KU) 159836, an adult female from Murmuntani, 3200 m, Departamento de Arica, Provincia de Tarapacá, Chile (latitude 18° 21' S, longitude 69° 27' W), collected on 23 November 1972 by Alberto Veloso M.

Diagnosis.—*Telmatobius pefauri* is a moderate-sized species that can be distinguished from its congeners by the following combination of characters: 1) hind limbs long—tibio-tarsal articulation of adpressed limb lying anterior to eye; 2) snout rounded in dorsal profile, depressed in lateral profile; 3) mandibular arch not prognathous; 4) nostrils barely protuberant; 5) tympanic annulus concealed externally and incompletely developed under the skin; 6) maxillary and premaxillary dentition embedded in mucosal labial folds; 7) dentigerous processes of prevomers small, horizontally oriented, bearing a moderate medial separation and located at the mid-level between large choanae; 8) eyes dorsolateral with a distinct anterior orientation; 9) tarsal fold well developed; 10) maxillary dentition present; and 11) prevomerine dentition present.

Description.—Adult female, moderately large and with robust body, 75 mm in snout-vent length (Fig. 1); males not known. Head large, its length 37 percent of snout-vent length, depressed and broader than long (head length only 82% of head width); in dorsal profile, snout broadly rounded and in lateral profile, long and sloping from the orbital region to a subacuminate terminus; lips thick and glandular externally and with maxillary and premaxillary teeth embedded in mucosal labial folds in the buccal cavity; nostrils small, scarcely protuberant, located approximately equidistant from the tip of the snout and the ventral margin of the lip and closer to the orbit than to the tip of the snout; internarial region flat; loreal region concave; canthus rostralis straight and poorly defined; tympanum absent externally but remnant of tympanic annulus present beneath skin. Supratympanic fold poorly developed and diminutive in size and length, extending from posterior border of orbit to approximately mid-point between end of mouth and axilla, where it is obscured within lateral skin folds of body. Eye large (diameter approximately 29% of head length), positioned far

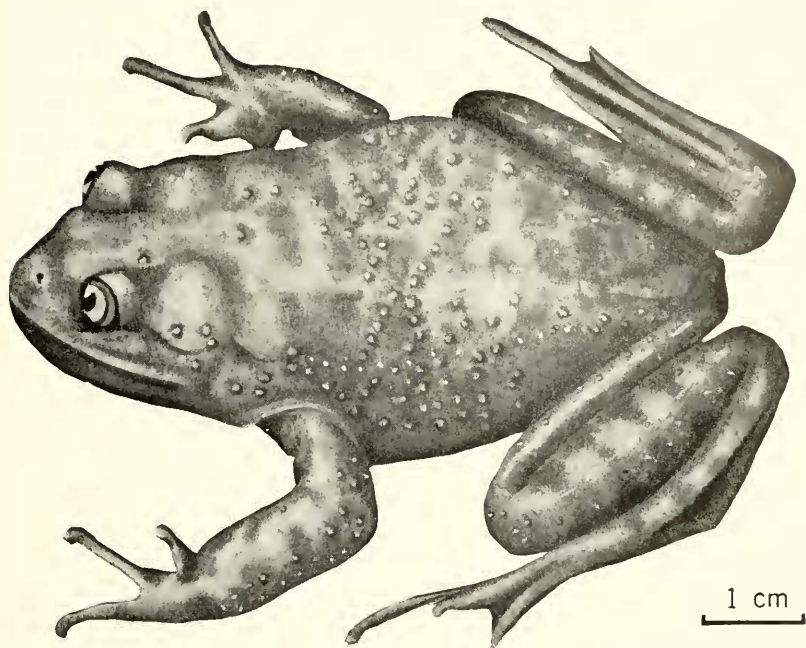


FIG. 1.—Holotype of *Telmatobius pefauri*, adult female (KU 159836). Line equals 1 cm.

forward on the head and bearing anterior orientation in life. Maxillary and premaxillary teeth well-developed "fangs" strongly recurved toward tongue and embedded within the labial mucosa so that only tips of teeth protrude into buccal cavity. Dentigerous processes of prevomers exceedingly small, lying approximately equidistant from each other and medial margins of choanae, bearing two and three fang-like teeth on right and left processes, respectively. Choanae large, subcircular and widely separated medially. Tongue large, circular, with posterior border free, unnotched.

Forelimb robust, lacking dermal wrist fold. First finger (Fig. 2a) much longer than second and about equal in length to third; length of fourth finger slightly subequal to that of third; digital length in decreasing order, III-IV-I-II; phalangeal formula 2-2-3-3. Palmar webbing absent. Tips of fingers slightly expanded into spherical pads and lateral margins of digits with distinct fringes. Inner palmar tubercle large, elliptical and depressed. Outer palmar tubercle prominent, quadrangular and elevated. One large, round subarticular tubercle present on each of first two fingers; each of digits III and IV with two, smaller, round subarticular tubercles. Supernumerary palmar tubercles present and well developed. Hind limbs long and slender, approximately twice length of body (Table 1). Toes long and slender (Fig. 2b), in decreasing order of length,

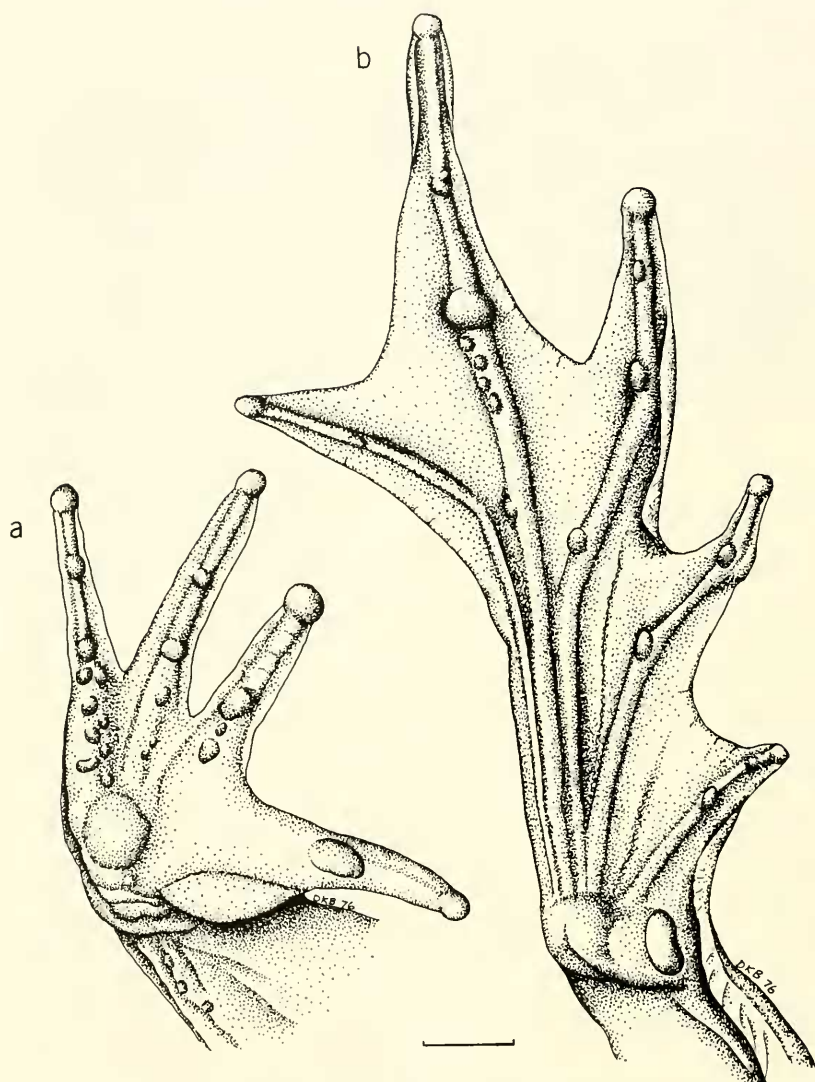


FIG. 2.—Hand and foot of *Telmatobius pefauri*: a) palmar view; b) plantar view. Line equals 5 mm.

IV-III-V-II-I; phalangela formula 2-2-3-4-3. Webbing formula I $1^{+} - 2$ II $1\frac{1}{2} - 2\frac{1}{2}$ III 2 - 3 IV 3 - 1 V; interdigital webbing smoothly concave, not sharply indented, diminishing distally to fringes along lateral margins of toes. Tips of toes spherical, slightly smaller than tips of fingers. Inner metatarsal tubercle small, elliptical and elevated. Outer metatarsal tubercle scarcely evident as an extremely small, round protuberance. Subarticular tubercles present but small

and poorly developed on toes; the distribution of subarticular tubercles per toe as follows: I(1), II(2), III(2), IV(3) and V(1); supernumerary tubercles small, scattered, few in number. Distinct tarsal fold extending length of tarsus and diminishing distally into fringe on inner margin of first (I) toe.

Dorsal skin smooth except for few, scattered, low tubercles in presacral region; profusion of small tubercles on flanks, ventral surface of forearm, knee, outer surfaces of tibia and tarsus and posteroventral surfaces of thighs; proliferation of small skin folds extending from posterior region of head posteroventrally along flanks. One, distinct, fleshy dermal ridge forming arc from postero-dorsal corner of axilla downward across mid-flank region. Ventral surfaces smooth except for few, low tubercles in cloacal region. Cloacal opening directed posteriorly at dorsal level of thighs; opening oriented transversely and inconspicuously ornamented below by folded, tuberculate skin.

Color in preservative: Uniform drab reddish brown above. Lips, side of head, anterior surface of upper arm, flanks and anterior surfaces of thighs gray to tan with indistinct mottling and small spots of dark, reddish brown. Gular and pectoral regions and inner surfaces of forelimb immaculate grayish tan; abdominal region darker gray-tan with fine gray mottling peripherally; ventral thighs and inner surfaces of hind limbs tan with moderately bold gray mottling along posterior margins of thighs and finer gray mottling peripheral to pale areas of hind limbs. Palmar and plantar surfaces uniform dark gray-brown except for creamy tan digital tips.

Color in life: Dorsal surfaces olive-brown with distinct, darker brown spots and mottling. Ventral surfaces grayish white, and anterior surfaces of thighs yellow-orange. Iris drab olive-brown with darker reticulations.

Chromosomes: Corneal epithelium chromosome preparations from the holotype revealed that *Telmatobius pefauri* has a diploid number of 26 metacentric and submetacentric chromosomes.

Distribution.—This species is known only from the type locality, a small stream at the village of Murmuntani located on the Pacific slopes of the Andean cordillera in northern Chile.

Remarks.—The single example of this distinctively long-limbed and large-headed *Telmatobius* was found at night underwater in a stream pool about 0.5 m deep. The stream is relatively small (about 1.5 m wide), lacks vegetation, and is characterized by scattered, shallow pools. The stream bed is composed of sand and flat, yellow stones. Because of the terrain and local usage, the stream gradient varies from moderately rapid to slow; downstream, damming has created a small reservoir utilized by livestock. This precordilleran locality is dry and characterized by a rocky substrate with low grasses and scattered bushes less than 1 m in height. *Bufo spinu-*

TABLE 1.—Measurements of the Holotype (KU 159836, adult ♀) of *Telmatobius pefauri*.

Character	Measurement (mm)
Snout-vent Length	75
Head Length	28
Head Width	34
Internarial Distance	5
Orbitonarial Distance	5
Diameter of Eye	8
Tibia Length	38
Tarsus Length	37
Total Foot Length	61

losus are abundant in this area, but aside from *Bufo*, the only other amphibian collected in several trips to this locality is the holotype of *Telmatobius pefauri*. Although most *Telmatobius* are notoriously secretive and elusive, we hope that future field work at Marmuntani will yield adults of both sexes and larvae of this species. The female emitted a release call similar to the clucking of a hen (Veloso, pers. observation).

DISCUSSION

Because of our limited knowledge of *Telmatobius pefauri* and the confused status of the numerous (± 26) and geographically widespread (Ecuador to Argentina and Chile) species included in the genus, it is premature to comment on the relationships of *pefauri* in more than a superficial way. This species differs from the five other known species of *Telmatobius* in Chile (*marmoratus*, *peruvianus*, *halli*, *montanus* and *laevis*) in being larger and having proportionally longer hind limbs. *Telmatobius pefauri* can be distinguished from *marmoratus* by the smoother skin (granular in the *marmoratus* that we have observed) and paler coloration of the former. The shape of the head and coloration differentiate *pefauri* from *peruvianus*, which has a more acuminate snout in dorsal view and is darker in color. *Telmatobius halli* differs from *pefauri* by the extremely depressed head and long, flat snout of the former. In contrast to *marmoratus*, *peruvianus* and *halli*, which occur in northern Chile, *montanus* and *laevis* are known only from the central Chilean cordillera, far south of the range of the northern species. Both of the southern species are characterized by moderately small size, short hind limbs and short, blunt snouts—a character suite that readily distinguishes them from *pefauri*.

Vellard (1951) defined four distributional and ecological groups of *Telmatobius*, as follows: 1) *peruvianus* group inhabiting streams and small ponds of the Andes of northern Argentina and Chile; 2) *marmoratus* group utilizing streams of the Titicaca Basin of Perú

and Bolivia; 3) *jelskii* group occurring in Andean streams of central Perú; and 4) *ignavus* group found in a variety of Andean habitats in northern Perú and Ecuador. On the basis of Vellard's (1955) analysis of the *jelskii* group, *pefauri* would seem to be allied most closely with this group morphologically. Among the characters that are shared are the following: 1) snout shape, 2) concealed tympanum, 3) tongue attached to the floor of the mouth over two-thirds of its length, 4) long hind limbs, 5) complete tarsal fold, 6) smooth skin, and 7) large, spherical and protuberant eyes, dorsolateral in position and directed anteriorly. However, notable differences prevail in the shape of the choanae and in the presence of prevomerine teeth in *pefauri*. Although this concordance of character states is real, we are not prepared to accept, *ex facie*, that *pefauri* should be considered a member of the *jelskii* group—a substantial evaluation of the systematic and evolutionary significance and variation of these and many other suites of characters is needed in order to determine their relative value in assessing the relationships within this complex and widespread genus.

It seems appropriate at this point to comment on some of the characters mentioned above. Snout shape is a useful specific character that basically reflects the osteological configuration of the maxillary-premaxillary arch and the orientation of the alary processes of the premaxillary. Preliminary evidence (Trueb, 1977) suggests that there is surprisingly little variation in snout shape within a species, although there are some instances of sexual dimorphism in frogs (e.g., see Duellman, 1970:84 and 447). cursory perusal of anuran systematic studies indicates that this is an unreliable character to utilize above the species level. Within those groups that Vellard has studied, he (1951) suggested that there is a trend toward loss of maxillary and prevomerine dentition; the loss of this dentition is substantiated further by Capurro (1955). The trend towards loss of teeth within a genus is interesting and perhaps unique. Loss of teeth on the maxillary arch uniformly characterizes only four anuran families—Bufonidae, Rhinodermatidae, Brachycephalidae and Rhinophrynidae. Most families possess some genera that are edentate (see Lynch, 1973, for a partial summary), but so far as we know, the edentate condition is consistent within the majority of genera (*Uperolia* and *Physalaemus* being notable exceptions). In the same paper, Vellard (1951:34) in his diagnosis of *Telmatobius marmoratus* stated: "*Dientes maxilares inferiores siempre presentes.*" We assume that "*inferiores*" is a lapsus for "*superiores*"; thus changing the meaning of the phrase to "upper maxillary teeth always present." If not, one would assume that he is referring to the presence of mandibular teeth—a condition known to occur only in the hyliid frog, *Amphignathodon guentheri*.

The presence or absence of a tympanum has been shown to be of

doubtful value in *Telmatobius*. Vellard (1955:11-12) stated that within discrete populations of *jelskii*, *longitarsis*, *rimac*, *walkeri* and *arequipensis* the tympanum may be present or absent. Furthermore, in some species uniformly lacking a tympanum, it has been found (Trueb, pers. observation) that the tympanic annulus underlying the skin may be present, absent or reduced with no apparent correlation with sex, age or population. Thus, the ear, as in the case of the dentition, seems to be undergoing reduction in some members of this genus.

The condition of the skin also is highly variable. Vellard (1951: 34) pointed out in his diagnosis of *Telmatobius marmoratus* that depending upon the "form," the skin may be smooth, tuberculate, warty, and with or without folds. Moreover, the condition of the skin of males of some species is known to change seasonally.

Probably two of the most characteristic features of the genus as a whole are the position and orientation of the eyes. Generally the eyes tend to be protuberant, usually dorsad on the head and frequently directed frontally. Unfortunately, these qualities, although obvious, are difficult to describe in such a way that interspecific comparisons are meaningful. Furthermore, it should be kept in mind that apparent differences in the size and position of the eye may be partly a function of, or exaggerated by, the shape and proportions of different parts of the head.

Before we can begin to assess the intrageneric relationships within *Telmatobius*, prodigious amounts of alpha taxonomic work remain to be done. Tadpoles are described for only a few species. The osteology and the extent and nature of vocalization are virtually unknown. The external morphology of the hands and feet has been described only sporadically. One of us (Veloso) is working with chromosomal characteristics of various *Telmatobius*. Integration and synthesis of these kinds of information with ecological, life history and distributional data should result in a better understanding of this peculiar group of leptodactylid frogs and their relationships to other members of the family.

RESÚMEN

Se describe una nueva especie de *Telmatobius* para el Norte de Chile, *Telmatobius pefauri*, sp. nov. La descripción se basa en un ejemplar hembra adulto capturado en la localidad de Murmuntani, Departamento de Arica, Provincia de Tarapacá, Chile. Los caracteres de la diagnosis que combinados separan esta especie de los restantes representantes del género son los siguientes: 1) patas posteriores largas, articulación tibiotarsal sobrepasa la órbita cuando la pata es llevada hacia adelante; 2) hocico redondeado en vista dorsal, cabeza deprimida en vista lateral; 3) arco mandibular no

sobrepasa la maxila; 4) narinas ligeramente protruidas; 5) dientes maxilares y premaxilares recubiertos por pliegues mucosos; 6) procesos dentígeros prevomerianos pequeños, orientados horizontalmente, medianamente separados entre coanas de tamaño grande; 7) dientes mandibulares ausentes; 8) ojos dorsolaterales proyectados hacia adelante; y 9) pliegue tarsal bien desarrollado.

El tamaño de la población de *Telmatobius pefauri* se considera pequeño, por cuanto sucesivas prospecciones del area no han permitido la captura de nuevos ejemplares. De acuerdo con las descripciones de *Telmatobius* señaladas por otros autores esta nueva especie se relacionaría desde el punto de vista de su morfología con especies del grupo *jelskii*. Sin embargo, una sustancial evaluación de la sistemática y variación de los caracteres observados es necesaria antes de determinar la inclusion de *T. pefauri* en alguna de las líneas filéticas reconocidas en *Telmatobius*.

Telmatobius pefauri, se reconoce facilmente de las otras cinco especies de *Telmatobius* señaladas para Chile (*marmoratus*, *peruvianus*, *halli*, *laevis* y *montanus*), por su talla y la longitud relativa de sus extremidades inferiores. *T. pefauri* se distingue de *marmoratus* por su piel lisa y su coloración, la forma de la cabeza y la coloración, diferencian *pefauri* de *peruvianus*. *Telmatobius halli* difiere de *pefauri* por su cabeza deprimida en sentido dorsoventral y por la longitud de su hocico. *Telmatobius pefauri* se diferencia de las especies *montanus* y *laevis* conocidas solamente para la cordillera central de Chile, frente a Santiago (Lat. 33° S), ambas especies de *Telmatobius* del Sur estan caracterizadas por su talla moderadamente pequeña, patas posteriores mas cortas y hocico redondeado.

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